

Application No. 09/508,934
Amendment dated February 13, 2004
Reply to Office Action of November 19, 2003

Amendments to the Claims:

This listing of claims will replace all prior versions and listings of claims in the application:

Listing of Claims:

1. (Currently Amended) A method for winding a stator of a brushless direct current motor having a stator body with a pre-determined number of stator teeth, wherein the stator teeth are respectively wound with two coils which are magnetically coupled and which permit the generation of opposite magnetic fields by the supply of current with variable directional orientation, and wherein each of the two coils comprises a predetermined number of conductors, the method comprising the steps of:

- a) simultaneously winding each of the two coils ~~into~~ onto said stator teeth in several partial winding steps with an even number of $2n$ conductors, allocating a first set of n conductors of the $2n$ conductors to a first coil of said two coils and allocating the other set of n conductors of the $2n$ conductors to a second coil of said two coils; and,
- b) repeating step a) until the predetermined number of conductors per coil has been reached.

2-10 (Canceled)

11. (Currently Amended) A coil winding method for winding a predetermined number of conductors to form a set of magnetically coupled coil pairs on a plurality of stator teeth of a stator body in a motor, each set of coil pairs generating opposing magnetic fields in the plurality of stator teeth, the coil winding method comprising the steps

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of:

in a first partial coil winding step,
simultaneously winding $2n$ conductors together onto a first plurality of stator teeth of said stator body, a first group n_1 of said $2n$ conductors being assigned to a first coil of said set of magnetically coupled coil pairs and a second group n_2 of said $2n$ conductors being assigned to a second coil of said set of magnetically coupled coil pairs; and,

repeating said simultaneous winding of said $2n$ conductors until said predetermined number of conductors are wound onto said first plurality of stator teeth to form a first magnetically coupled coil pair of said set of magnetically coupled coil pairs.

12. (Previously Presented) A coil winding method for winding a predetermined number of conductors to form a set of magnetically coupled coil pairs on a plurality of stator teeth of a stator body in a motor, each set of coil pairs generating opposing magnetic fields in the plurality of stator teeth, the coil winding method comprising:

a) in a first partial coil winding step, simultaneously winding $2n$ conductors together onto a first plurality of stator teeth of said stator body;

b) selecting a first group n_1 of said $2n$ conductors and assigning the first group n_1 to a first coil of said set of magnetically coupled coil pairs;

c) selecting a second group n_2 of said $2n$ conductors and assigning the second group n_2 to a second coil of said set of magnetically coupled coil pairs;

d) repeating steps a) through c) until said

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predetermined number of conductors are wound onto said first plurality of stator teeth to form a first magnetically coupled coil pair of said set of magnetically coupled coil pairs; and,

winding said predetermined number of conductors on a second plurality of stator teeth of said stator body in said motor to form a second magnetically coupled coil pair of said set of magnetically coupled coil pairs.

13. (Previously presented) The method according to claim 12 wherein the step of winding said predetermined number of conductors on said second plurality of stator teeth includes the steps of:

e) in a second partial coil winding step, simultaneously winding $2n$ conductors together onto a second plurality of stator teeth of said stator body;

f) selecting a third group n_3 of said $2n$ conductors and assigning the third group n_3 to a third coil of said set of magnetically coupled coil pairs;

g) selecting a fourth group n_4 of said $2n$ conductors and assigning the fourth group n_4 to a fourth coil of said set of magnetically coupled coil pairs; and,

h) repeating steps e) through g) until said predetermined number of conductors are wound onto said second plurality of stator teeth to form said second magnetically coupled coil pair of said set of magnetically coupled coil pairs.

14. (Previously presented) The method according to claim 13 wherein;

the first partial coil winding step includes

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simultaneously winding said $2n$ conductors onto said first plurality of stator teeth different from said second plurality of stator teeth; and,

the second partial coil winding step includes simultaneously winding said $2n$ conductors onto said second plurality of stator teeth different from said first plurality of stator teeth.

15. (Previously presented) The method according to claim 14 wherein:

the first partial coil winding step of simultaneously winding said $2n$ conductors onto said first plurality of stator teeth includes simultaneously winding two conductors onto said first set of six stator teeth; and,

the second partial coil winding step of simultaneously winding said $2n$ conductors onto said second plurality of stator teeth includes simultaneously winding two conductors onto said second set of six stator teeth.

16. (Previously Presented) A coil winding method for winding a predetermined number of conductors to form a set of magnetically coupled coil pairs on a plurality of stator teeth of a stator body in a motor, each set of coil pairs generating opposing magnetic fields in the plurality of stator teeth, the coil winding method comprising:

a) in a first partial coil winding step, simultaneously winding $2n$ conductors together onto a first plurality of stator teeth of said stator body;

b) selecting a first group n_1 of said $2n$ conductors and assigning the first group n_1 to a first coil

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of said set of magnetically coupled coil pairs;

c) selecting a second group n_2 of said $2n$ conductors and assigning the second group n_2 to a second coil of said set of magnetically coupled coil pairs; and,

d) repeating steps a) through c) until said predetermined number of conductors are wound onto said first plurality of stator teeth to form a first magnetically coupled coil pair of said set of magnetically coupled coil pairs; and, wherein: the step of assigning said first group n_1 of said $2n$ conductors includes, prior to performing each said at least one first partial winding step, connecting said first group n_1 of said $2n$ conductors to a first electrical connection contact 15_I on said stator body, and the step of assigning said second group n_2 of said $2n$ conductors includes, prior to performing each said at least one first partial winding step, connecting said second group n_2 of said $2n$ conductors to a second electrical connection contact 15_{II} on said stator body.

17. (Previously presented) The method according to claim 16 wherein:

the step of assigning said first group n_1 of said $2n$ conductors further includes, after performing said each at least one first partial winding step, connecting said first group n_1 of said $2n$ conductors to a third electrical connection contact 15_{III} on said stator body; and,

the step of assigning said second group n_2 of said $2n$ conductors further includes, after performing said each at least one first partial winding step, connecting said second group n_2 of said $2n$ conductors to a fourth electrical connection contact 15_{IV} on said stator body.

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18. (Currently Amended) A stator having a stator body defining a plurality of stator teeth carrying conductors to form a set of magnetically coupled coil pairs, the conductors being wound onto said stator teeth by:

in a first partial coil winding step, forming a first coupled coil pair by:

a) simultaneously winding $2n$ conductors together onto a first plurality of stator teeth of said stator body;

b) selecting a first group n_1 of said $2n$ conductors and assigning the first group n_1 to a first coil of said first coupled coil pair; and,

c) selecting a second group n_2 of said $2n$ conductors and assigning the second group n_2 to a second coil of said first coupled coil pair; and,

repeating steps a) through c) until said predetermined number of conductors are wound onto said first plurality of stator teeth whereby said predetermined member of conductors are intermingled achieving a close mutual proximity to form said first magnetically coupled coil pair of said set of magnetically coupled coil pairs, the first magnetically coupled coil pair having a substantially uniform winding distribution.

19. (Currently Amended) A stator having a stator body defining a plurality of stator teeth carrying conductors to form sets of magnetically coupled coil pairs, the conductors being wound onto said stator teeth by:

a) in a first partial coil winding step,

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simultaneously winding a first pair of conductors together onto a first plurality of stator teeth of said stator body;

b) selecting a first group n_1 of said first pair of conductors and assigning the first group n_1 to a first coil of said set of magnetically coupled coil pairs;

c) selecting a second group n_2 of said first pair of conductors and assigning the second group n_2 to a second coil of said set of magnetically coupled coil pairs;

d) repeating steps a) through c) until a first predetermined number of conductors are wound onto said first plurality of stator teeth whereby said first predetermined number of conductors are intermingled achieving a close mutual proximity to form a first magnetically coupled coil pair;

e) in a second partial coil winding step, simultaneously winding a second pair of conductors together onto a second plurality of stator teeth of said stator body different from said first plurality of stator teeth;

f) selecting a third group n_3 of said second pair of conductors and assigning the third group n_3 to a third coil of said set of magnetically coupled coil pairs;

g) selecting a fourth group n_4 of said second pair of conductors and assigning the fourth group n_4 to a fourth coil of said set of magnetically coupled coil pairs; and,

h) repeating steps e) through g) until a second predetermined number of conductors are wound onto said second plurality of stator teeth whereby said second predetermined number of conductors are intermingled achieving a close mutual proximity to form a second magnetically coupled coil pair.

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20. (Previously presented) A coil winding method for winding a predetermined number of conductors to form a set of magnetically coupled coil pairs on a plurality of stator teeth of a stator body in a motor, each set of coil pairs generating opposing magnetic fields in the plurality of stator teeth, the coil winding method comprising:

a) in a partial coil winding step, simultaneously winding $2n$ conductors together onto a first plurality of stator teeth of said stator body;

b) selecting a first group n_1 of said $2n$ conductors and assigning the first group n_1 to a first coil of said set of magnetically coupled coil pairs by, prior to performing said partial winding step, connecting said first group n_1 of said $2n$ conductors to a first electrical connection contact on said stator body;

c) selecting a second group n_2 of said $2n$ conductors and assigning the second group n_2 to a second coil of said set of magnetically coupled coil pairs by, prior to performing said partial winding step, connecting said second group n_2 of said $2n$ conductors to a second electrical connection contact on said stator body; and,

d) repeating steps a) through c) until said predetermined number of conductors are wound onto said first plurality of stator teeth to form a first magnetically coupled coil pair of said set of magnetically coupled coil pairs.

21. (Previously presented) A coil winding method for winding a predetermined number of conductors to

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form a set of magnetically coupled coil pairs on a plurality of stator teeth of a stator body in a motor, each set of coil pairs generating opposing magnetic fields in the plurality of stator teeth, the coil winding method comprising:

a) in a first partial coil winding step, simultaneously winding a first pair of conductors together onto a first plurality of stator teeth of said stator body;

b) selecting a first group n_1 of said first pair of conductors and assigning the first group n_1 to a first coil of said set of magnetically coupled coil pairs;

c) selecting a second group n_2 of said first pair of conductors and assigning the second group n_2 to a second coil of said set of magnetically coupled coil pairs;

d) repeating steps a) through c) until said predetermined number of conductors are wound onto said first plurality of stator teeth to form a first magnetically coupled coil pair of said set of magnetically coupled coil pairs;

e) in a second partial coil winding step, simultaneously winding a second pair of conductors together onto a second plurality of stator teeth of said stator body different from said first plurality of stator teeth;

f) selecting a third group n_3 of said second pair of conductors and assigning the third group n_3 to a third coil of said set of magnetically coupled coil pairs;

g) selecting a fourth group n_4 of said second pair of conductors and assigning the fourth group n_4 to a fourth coil of said set of magnetically coupled coil pairs; and,

h) repeating steps e) through g) until said

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predetermined number of conductors are wound onto said second plurality of stator teeth to form said second magnetically coupled coil pair of said set of magnetically coupled coil pairs.

22. (Currently Amended) A stator having a stator body defining a plurality of stator teeth carrying conductors to form a set of magnetically coupled coil pairs, the conductors being wound onto said stator teeth by:

forming a first magnetically coupled coil pair by:

a) simultaneously winding $2n$ conductors together onto a first plurality of stator teeth of said stator body;

b) selecting a first group n_1 of said $2n$ conductors and assigning the first group n_1 to a first coil of said first coupled coil pair; and,

c) selecting a second group n_2 of said $2n$ conductors and assigning the second group n_2 to a second coil of said first coupled coil pair;

repeating steps a) through c) until said a first predetermined number of conductors are wound onto said first plurality of stator teeth whereby said first predetermined number of conductors are intermingled achieving a close mutual proximity to form said first magnetically coupled coil pair of said set of magnetically coupled coil pairs;

forming a second magnetically coupled coil pair by:

d) simultaneously winding $2n$ conductors together onto a second plurality of stator teeth of said stator body;

e) selecting a first group n_1 of said

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2n conductors and assigning the first group n_1 to a first coil of said second coupled coil pair; and,

f) selecting a second group n_2 of said 2n conductors and assigning the second group n_2 to a second coil of said second coupled coil pair;

repeating steps d) through f) until said a second predetermined number of conductors are wound onto said second plurality of stator teeth whereby said second predetermined number of conductors are intermingled achieving a close mutual proximity to form said second magnetically coupled coil pair of said set of magnetically coupled coiled pairs.

23. (Previously Presented) The method according to claim 11 further including:

winding said predetermined number of conductors on a second plurality of stator teeth of said stator body in said motor to form a second magnetically coupled coil pair of said set of magnetically coupled coil pairs.

24. (Previously Presented) The method according to claim 23 wherein the step of winding said predetermined number of conductors on said second plurality of stator teeth includes the steps of:

e) in a second partial coil winding step, simultaneously winding 2n conductors together onto a second plurality of stator teeth of said stator body;

f) selecting a third group n_3 of said 2n conductors and assigning the third group n_3 to a third coil of said set of magnetically coupled coil pairs;

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g) selecting a fourth group n_4 of said $2n$ conductors and assigning the fourth group n_4 to a fourth coil of said set of magnetically coupled coil pairs; and,

h) repeating steps e) through g) until said predetermined number of conductors are wound onto said second plurality of stator teeth to form said second magnetically coupled coil pair of said set of magnetically coupled coil pairs.

25. (Previously Presented) The method according to claim 24 wherein;

the first partial coil winding step includes simultaneously winding said $2n$ conductors onto said first plurality of stator teeth different from said second plurality of stator teeth; and,

the second partial coil winding step includes simultaneously winding said $2n$ conductors onto said second plurality of stator teeth different from said first plurality of stator teeth.

26. (Previously Presented) The method according to claim 25 wherein:

the first partial coil winding step of simultaneously winding said $2n$ conductors onto said first plurality of stator teeth includes simultaneously winding two conductors onto said first set of six stator teeth; and,

the second partial coil winding step of simultaneously winding said $2n$ conductors onto said second plurality of stator teeth includes simultaneously winding two conductors onto said second set of six stator teeth.

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27. (Previously Presented) The method according to claim 11 wherein:

the step of assigning said first group n_1 of said $2n$ conductors includes, prior to performing each said at least one first partial winding step, connecting said first group n_1 of said $2n$ conductors to a first electrical connection contact 15_I on said stator body; and,

the step of assigning said second group n_2 of said $2n$ conductors includes, prior to performing each said at least one first partial winding step, connecting said second group n_2 of said $2n$ conductors to a second electrical connection contact 15_{II} on said stator body.

28. (Previously Presented) The method according to claim 27 wherein:

the step of assigning said first group n_1 of said $2n$ conductors further includes, after performing said each at least one first partial winding step, connecting said first group n_1 of said $2n$ conductors to a third electrical connection contact 15_{III} on said stator body; and,

the step of assigning said second group n_2 of said $2n$ conductors further includes, after performing said each at least one first partial winding step, connecting said second group n_2 of said $2n$ conductors to a fourth electrical connection contact 15_{IV} on said stator body.